



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10
1200 Sixth Avenue
Seattle, WA 98101

JUL 28 2003

Reply To
Attn Of: WCM-127

Mr. Steven Tochko, Manager
Environmental Remediation
Energy & Environmental Affairs
The Boeing Company
P.O. Box 3707 MS 7A-WW
Seattle, WA 98124-2207

**Re: EPA Decision: Duwamish Sediment Other Area
Southern Boundary Sampling and Western Boundary Dispute
Boeing Plant 2 Seattle/Tukwila, Washington
EPA ID No. WAD 00925 6819
RCRA Docket No. 1092-01-22-3008(h)**

Dear Mr. Tochko:

This letter documents the U.S. Environmental Protection Agency's (EPA) decision regarding the disputed southern and western boundaries of the Duwamish Sediment Other Area (DSOA) in the Lower Duwamish Waterway. In accordance with Paragraph 17.2 of the January 1994 Administrative Order on Consent (Order) issued to The Boeing Company (Boeing) pursuant to Section 3008(h) of the Resource Conservation and Recovery Act (RCRA), as amended, 42 U.S.C. § 6928(h), this decision is final and formally resolves the dispute regarding sediment sampling in the areas south of the current DSOA southern boundary and dredging along the western boundary of the DSOA.

With respect to the western boundary of the DSOA, Boeing is hereby directed to implement EPA's September 16, 2002 *Western Boundary Dredge Plan Technical Memorandum* (Dredge Plan) as discussed and clarified in meetings between EPA and Boeing on December 13, 2002 and January 22, 2003. The Dredge Plan is enclosed with this letter. The Dredge Plan calls for the dredge cut to begin at the 4 or 5 foot depth and proceed down towards the margin of the Federal Channel. The dredge prism will be determined by the required depth of the Federal Channel and the requirements for a stable slope.

With respect to the southern boundary of the DSOA, Boeing is hereby directed to implement a sampling investigation in accordance with EPA's March 12, 2003 *Additional Sampling and Analysis, Southern Boundary Data Quality Objectives Memorandum, Revision 1 (Memorandum)*. The area to be investigated includes the area of interest depicted in Figure 1 of the Memorandum. This area is bounded on the north by the western margin of the DSOA as proposed by Boeing; on the west by the Federal navigation channel, on the east by a line 50 feet off the toe of the riprap slope (except for a short distance between outfalls 7 and 8 where it is reduced to about 35 feet off of the toe of the riprap slope); and on the south by the southern property line of the Jorgensen Forge facility. The Memorandum has been previously provided to Boeing, and is enclosed with this letter for convenience.

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Within 30 days from receipt of this decision letter, Boeing must submit a sampling plan for the DSOA southern boundary investigation, and a dredge plan for the western DSOA boundary which conforms to this decision.

Background of Disputed Issues

This background is not meant to be complete or fully detailed, but is presented for contextual purposes. Pursuant to Paragraph 17.3 of the Order, EPA has maintained an administrative record of all correspondence and submittals related to the disputed issues. EPA acknowledges that Boeing has performed much excellent work as reflected in numerous plans and reports associated with the DSOA sediment investigation and cleanup design.

Boeing proposed a corrective action to clean up sediment along the length of the Plant 2 facility out to the top of the east slope of the Duwamish Waterway navigation channel in the Revised Draft Focused Corrective Measures Study Report (FCMS) submitted to EPA in June 1999. EPA approved the proposed sediment remedy in concept in the FCMS in July 1999 anticipating the development of details such as the precise lateral extent and depth of dredge contours during the design phase. EPA formally informed Boeing that the sediment cleanup at Plant 2 would be an Interim Measure (IM) by letter dated January 28, 2000, rather than as a final corrective action. It is important to note parenthetically that IMs may be considered final actions if it is determined that no further action is necessary. EPA's decision to require that the sediment cleanup work be conducted as an IM was related to EPA's concerns as to how the proposed RCRA corrective measure would impact activities conducted in the Duwamish Waterway pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

In June 2000, Boeing submitted the DSOA Preferred Remedy Interim Measures Work Plan (Work Plan) to EPA. On October 5, 2000, EPA and the Natural Resource Trustees submitted comments to Boeing which stated that the project boundaries should reflect the extent of significant contamination and not be determined solely by property boundaries. On October 25, 2000, EPA and Boeing met to discuss the boundary concerns raised in the October 5, 2000 letter, but Boeing did not agree to revise the DSOA boundary leaving the boundary issues unresolved. EPA documented the results of the October 25, 2000 meeting in a November 15, 2000 letter to Boeing. Over the next year, EPA continued to emphasize moving forward with the design process for Boeing's proposed dredging and capping of the DSOA, with the hope that the disputed boundary issues could be resolved without delaying implementation of the sediment remedy.

On November 1, 2001, Boeing submitted the DSOA Alternative Corrective Measures Evaluation Report (ACMER) to EPA. On January 11, 2002, EPA transmitted comments to Boeing on the ACMER. The January 11, 2002 comments letter also approved the Alternative Corrective Measures Evaluation Work Plan provided all issues raised by EPA's comments on the ACMER were successfully resolved. The most critical issue covered by the EPA comments concerned the boundaries of the DSOA proposed by Boeing in the ACMER which continued to be delineated by extension into the waterway of the Boeing Plant 2 southern property boundary rather than the extent of significant contamination. Related issues included the use of professional judgement in the geospatial analysis of data within the proposed DSOA boundary, and the Conceptual Site Model (CSM) for patterns of polychlorinated biphenyl (PCB) distribution within the DSOA.

On February 22, 2002, Boeing electronically submitted "Preliminary Responses to EPA Comments" on the ACMER. In this document, Boeing stated that professional judgement was used by Boeing in the geospatial analysis of the DSOA data because the sediment pattern in the Duwamish Waterway had been highly modified by dredging.

On March 5, 2002, EPA and Boeing met to discuss EPA's comments on the ACMER and Boeing's preliminary responses. During this meeting the issues surrounding Boeing's geospatial analysis were discussed.

In a May 23, 2002 letter, EPA directed Boeing to do the following pursuant to the Order:

- Further investigate and characterize the sediments off the eastern shore of the Lower Duwamish Waterway south of Plant 2, at least as far upriver as the Kenworth property;
- Modify the western boundary in accordance with EPA recommendations which were provided to Boeing in June 2002; and,
- Conduct an investigation of newly-discovered upland PCB releases on the southern portion of the Plant 2 facility.

In the May 23, 2002 letter, EPA agreed to provide Boeing with an evaluation of Boeing's preliminary responses to EPA's comments on the ACMER, a modified conceptual design for dredging the western boundary, and a focused framework for a sampling and analysis plan to further characterize the near shore sediment south of Boeing's proposed DSOA.

On June 5, 2002, Boeing provided notice to EPA that in accordance with Section XVII of the Order, Boeing disagreed with the direction given to Boeing by EPA in the May 23, 2002 letter and was invoking the dispute resolution provisions. In this letter, Boeing submitted that there was no "legitimate legal or factual basis for the evident intent of EPA's direction." Boeing also stated in this letter that in 1999 the DSOA boundaries were approved by EPA's administrative approval of the FCMS.

EPA responded to Boeing's June 5, 2002 letter, in a letter dated June 6, 2002, in which EPA clarified its approval of the FCMS. In this letter, EPA stated that in approving the FCMS, EPA did not approve the boundaries of the DSOA. EPA approved only the dredge and cap remedial concept with the boundaries of the DSOA to be determined during the design phase. EPA's concerns about the DSOA boundaries had been previously communicated to Boeing in correspondence and meetings as noted above. In the June 5, 2002 letter, EPA also proposed that Boeing's invocation of dispute resolution under the Order be suspended until 15 days after the later of the following two events, 1) Boeing received the information referenced in EPA's May 23, 2002 letter, and 2) a PCB fate and transport meeting requested by Boeing was concluded.

On June 14, 2002, Boeing declined EPA's proposal to delay invocation of dispute resolution and requested that EPA meet with Boeing, on or before June 19, 2002. EPA responded on June 18, 2002 stating that EPA understood Boeing's desire to remain within the dispute resolution parameters set forth in the Order and that EPA was working on coordinating schedules for the PCB fate and transport meeting.

On June 20, 2002, EPA met with Boeing to discuss general items related to the disputed issues. At this meeting, Boeing stated that issues related to the southern boundary could not be separated from those

related to the western boundary since the river processes which led to the distribution of PCB contamination in these areas were similar. Boeing requested that EPA present its technical rationale for requiring Boeing to conduct further sampling and investigations south and west of Boeing's proposed DSOA at the upcoming PCB fate and transport meeting.

On June 27, 2002, Boeing submitted a draft Transformer PCB Investigation Plan to EPA, but still reserved its rights under the Order to dispute EPA's direction as per Boeing's June 5, 2002 letter. Also, on June 27, 2002, Boeing notified EPA that construction of the planned cleanup work in the Waterway would be shifted from 2003 to 2004 pending EPA's approval of the project concept.

EPA issued a decision on the investigation of newly-discovered upland PCB releases on the southern portion of the Plant 2 facility in a letter to Boeing on July 5, 2002. This decision letter directed Boeing to conduct the transformer PCB investigation and documented EPA's rationale for requiring Boeing to conduct the transformer investigation pursuant to Section 3008(h) of RCRA.

On July 22, 2002, EPA transmitted its evaluation of Boeing's preliminary responses on the ACMER as per EPA's May 23, 2002 letter. In these responses, EPA notified Boeing that EPA had generated an independent geospatial interpretation of the data which was different than that generated by Boeing and presented in the ACMER. This difference translated to differences in Boeing's preferred dredging plan. EPA proposed a dedicated meeting on this subject. In addition, EPA notified Boeing that the U.S. Army Corps of Engineers records did not indicate that dredging occurred during a period which would have likely impacted contaminant distribution within the DSOA, and that Boeing's CSM failed to describe the process that explained observed PCB depositional patterns in the Lower Duwamish Waterway.

On the morning of July 23, 2002, EPA presented its technical position at the PCB fate and transport meeting which Boeing had previously requested. EPA stated our belief that both natural and man-made processes have enabled contaminated sediments originating from areas adjacent to Boeing Plant 2 to migrate upstream to as far south as the Kenworth property. Natural processes include current/tidal effects, fresh and saltwater mixing and storm events. Man-made processes include propeller wash and vessel scouring.

During the afternoon session of the July 23, 2002 PCB fate and transport meeting, Boeing gave a presentation to EPA which summarized what Boeing offered as the record demonstrating that EPA had previously approved the DSOA boundaries. In addition, Boeing presented information on industrial uses and current outfalls on the adjoining Jorgensen property which Boeing believed indicated that PCB releases likely have occurred at or from that facility, and that EPA should more completely investigate the Jorgensen Forge facility with regard to sediment contamination south of Plant 2.

Boeing summarized its understanding of the outcome of the July 23, 2002 meetings and discussions concerning the disputed issues in a letter to EPA dated August 2, 2002. In this letter, Boeing once again reiterated its belief that EPA had previously approved Boeing's proposed DSOA boundaries.

In a separate letter dated August 2, 2002, Boeing responded to EPA's July 22, 2002 letter concerning the ACMER. In this letter, Boeing requested a meeting with EPA to clarify certain specific comments by EPA, including deferring certain administrative and technical decisions to the design phase.

On August 8, 2002, EPA replied to Boeing's August 2, 2002 summary of the results of the July 23, 2002 PCB fate and transport meeting. In this letter, EPA noted that EPA categorically disagreed with Boeing's assertions during the fate and transport meeting and in prior correspondence that EPA had previously approved Boeing's proposed DSOA boundaries.

On August 15, 2002, EPA transmitted the *Additional Sampling and Analysis, Southern Boundary, Data Quality Objectives (DQO) Memorandum* to Boeing which is the focused framework for the sampling and analysis plan (SAP) for the DSOA southern boundary as discussed in EPA's letter dated May 23, 2002.

On August 22, 2002, EPA provided clarification to Boeing that the SAP was due 30 days after EPA issued its decision letter in the ongoing Dispute Resolution process.

In a September 18, 2002 letter concerning the *Transformer PCB Investigation Plan*, EPA informed Boeing that EPA anticipated negotiating with Jorgensen representatives to conduct additional investigatory work to determine if releases to the Duwamish Waterway have occurred from the Jorgensen Forge facility.

On September 30, 2002, EPA transmitted the *Western Boundary Dredge Plan Technical Memorandum* to Boeing which was the last EPA deliverable discussed in the May 23, 2002 letter. This letter also notified Boeing that pursuant to Paragraph 17.2 of the Order, Boeing and EPA had 14 days from receipt of this last deliverable to resolve the issues under dispute and that EPA could extend the 14 period for good cause. Absent extension(s), if agreement was not reached within the 14 day period, EPA would issue a written determination of the issues in dispute.

On October 9, 2002, Boeing requested that EPA reverse its September 30, 2002 notice invoking Paragraph 17.2 of the Order, as Boeing believed that invoking Paragraph 17.2 was premature in that discussions with EPA were ongoing.

On October 10, 2002, EPA extended for good cause the 14 day resolution period until after a meeting scheduled for October 15, 2002 between EPA Region 10 Regional Administrator, John Iani, and Kirk Thomson, Director, Environmental Affairs for Boeing.

On October 15, 2002, John Iani, Howard Orlean and I met with Kirk Thomson and Steven Tochko of Boeing to discuss the disputed issues. Topics discussed during this meeting included: (1) EPA's concern about the potential for recontamination of clean sediments from contamination that would be left in place immediately adjacent to Boeing's proposed southern boundary of the DSOA; (2) high levels of PCB contamination at areas of the Duwamish Waterway at least several hundreds of feet south of the Boeing's proposed DSOA at Lower Duwamish Waterway Early Action Candidate # 8 (Area # 8) as proposed by the Lower Duwamish Waterway Group which includes Boeing; (3) the cost to Boeing should Boeing be required to sample and remediate contaminated sediment as far south as the Kenworth property; (4) remaining issues regarding the western boundary of the DSOA; (5) drainage areas of the storm water outfalls along the Plant 2 and Jorgensen Forge boundaries; and (6) the upcoming meeting between Boeing and EPA on the City Light Transformers situated on the southern end of Plant 2. It was agreed at the conclusion of the meeting that while progress had been made on the disputed issues, the dispute process should be held in abeyance until several additional actions and meetings were completed.

In an October 25, 2002 letter from Mr. Thomson to Mr. Iani, Boeing clarified that at Area # 8 there were exceedances of target values for polyaromatic hydrocarbons (PAHs) and that PCBs at this area were above the Washington State sediment management standards (SMS) sediment quality standard (SQS), but below the cleanup screening level (CSL) for PCBs. In addition, Boeing provided EPA with a list of additional actions which Boeing believed needed to occur prior to concluding the dispute process. These actions included meetings on the Transformer Investigation Work Plan, clarification of EPA's *Western Boundary Dredge Plan Technical Memorandum*, and Boeing's proposed conceptual design.

On October 28, 2002, EPA and Boeing met to discuss issues concerning the scope of the Transformer Investigation Work Plan. During this meeting, Boeing proposed to sample soil and sediment along several transects on the southwest corner of Plant 2 and the northwest corner of the adjoining Jorgensen Forge facility in order to delineate the extent of contamination from the transformer.

On October 29, 2002, Boeing formally requested an additional extension of the dispute period.

On October 31, 2002, Boeing provided maps to EPA generated by either Boeing or King County of the storm water outfalls near Area # 8 and along the Plant 2 and Jorgensen Forge property boundaries.

On November 4, 2002, EPA transmitted a letter to Boeing which extended the dispute period to January 3, 2003. In this letter, EPA explained that EPA intended to issue its decision on the western and southern disputed DSOA issues concurrently. EPA also requested that Boeing provide supporting documentation concerning Boeing's position on the DSOA southern boundary by December 13, 2002.

At a meeting with EPA on December 10, 2002, Boeing presented its technical position regarding the disputed southern DSOA boundary. Boeing's primary point during its presentation was that the mechanisms of sediment transport which were presented by EPA at the July 23, 2002 fate and transport meeting could not be responsible for the PCB contaminant patterns seen in the sediments of the Duwamish Waterway south of Plant 2. According to this presentation, Boeing reiterated its technical position from the July 23, 2002 meeting, which is that the hot spots of PCB contamination south of Plant 2 were primarily caused by immediately adjacent local sources (e.g., storm water outfalls) and that high levels of PCB contamination in the Lower Duwamish Waterway cannot or do not migrate, especially southward.

On December 13, 2002, Boeing transmitted a document entitled "Dispute Technical Report" (Report) to EPA which presented Boeing's position relative to the dispute over the boundaries of the DSOA. In the cover letter transmitted with this document, Boeing concluded that EPA "lacks authority" under the Order to require Boeing to sample beyond Boeing's proposed DSOA boundaries. This conclusion appears to be based on Boeing's continuing position that this lack of authority derives from Boeing's assertions that EPA previously approved the boundaries of the DSOA, rather than any lack of authority under Section 3008(h) of RCRA to investigate and address the areal extent of contamination arising from releases of hazardous constituents from Plant 2. Most of this document included historical documentation already familiar to Boeing and EPA, however Appendix C of the Report contained a discussion of contaminant fate and transport mechanisms in the Lower Duwamish Waterway. This discussion concluded that contaminant migration from Plant 2 could not produce the observed pattern of contamination south of the DSOA.

On December 17, 2002, EPA, Ecology, and Boeing met to discuss Plant 2 DSOA western boundary dispute issues and DSOA spatial analysis issues. During this meeting, Boeing requested that EPA use its spatial analysis approach to provide a proposed variable depth dredge plan to Boeing. EPA agreed to provide the dredge plan to Boeing. Boeing presented a vertical profile of sampling taken along the western boundary. Based on Boeing's vertical profile, EPA identified a data gap in the sampling analyses which Boeing agreed to address.

At a meeting on January 22, 2003, EPA presented the proposed variable depth dredge plan to Boeing as promised at the December 17, 2002 meeting. Boeing agreed during the meeting that EPA's variable depth dredge plan more closely matched the dredge plan proposed by Boeing at the December 17th meeting. Boeing and EPA then agreed on additional sampling locations to address the data gap and refine the proposed dredge prisms.

On February 7, 2003, Boeing submitted the SAP to EPA which would address the additional vertical characterization agreed to at the meeting on January 22, 2002.

On March 13, 2003, based in part on documentation submitted by Boeing during the dispute process, EPA presented a compromise approach to Boeing designed to resolve all disputed issues and accomplish the sampling objectives west and south of the proposed DSOA. The EPA proposal would not require Boeing to sample south of the Jorgensen/Boeing Issacson property line. In addition, EPA informed Boeing that EPA was negotiating with Jorgensen representatives to sample sediment and outfalls adjacent to the Jorgensen Forge property. The EPA proposal included requiring Jorgensen Forge to sample sediment from the toe of the sloped bank outwards at least 50 feet westward into the waterway. Boeing would then be responsible for sampling from 50 feet of the toe westward to the navigation channel. Boeing informed EPA that it would consider EPA's compromise, but even if the disputed issues were immediately resolved sediment cleanup work could not begin until the 2005 field season.

On April 23, 2003, Howard Orlean and Anna Filutowski of EPA met with Teri Floyd, a consultant representing Boeing, to discuss a counterproposal put forward by Boeing to resolve the disputed western and southern boundary issues. Under this counterproposal, Boeing would implement EPA's Dredge Plan for the western boundary and source delineation sampling proposed in Boeing's Transformer Investigation Plan, but would perform no other sampling south of Plant 2. Ms. Floyd expressed Boeing's interest in moving forward with the sediment cleanup as quickly as possible.

On May 8, 2003, Mr. Orlean and Ms. Filutowski met with Will Ernst and Michael Gleason of Boeing to discuss Boeing's counterproposal. EPA informed Boeing that the Boeing counterproposal would not enable EPA to obtain the necessary sampling for Area I. Boeing expressed concern over an alleged subjectiveness of EPA's compromise proposal of March 13, 2003, which would require Boeing to sample from 50 feet west of the toe of the Jorgensen bank westward to the navigation channel. EPA informed Boeing that since EPA still had no evidence that the Jorgensen Forge facility was or had been a source of PCB contamination, EPA believed its compromise proposal of March 13, 2003 was a fair and technically sound approach to accomplishing the needed sampling south of Plant 2. The meeting concluded without EPA and Boeing reaching agreement on a means to delineate the western and southern boundaries of the DSOA.

Since May 8, further efforts by EPA and Boeing representatives to persuade one another of the respective merits of their respective positions have been unavailing.

Rationale for Decision

As summarized above, the dispute over further southern boundary-related sampling and western boundary of the DSOA has been ongoing since June 5, 2002. Despite myriad correspondence in addition to numerous formal and informal discussions and meetings, EPA and Boeing have not been able to resolve certain fundamental issues. Despite these fundamental disagreements, EPA recognizes that work has progressed on items such as the proposed dredge prisms in the western portion of the DSOA, the PCB transformer source investigation, groundwater fate and transport issues, and remediation of the southwest bank.

The Order requires Boeing to implement IMs in addition to performing the investigatory and study phases for final RCRA Corrective Action, subject only to the Dispute Resolution provisions in Section XVII. The Order also requires implementation of final Corrective Action selected by EPA in a Statement of Basis, subject to Boeing's right to withdraw its consent in Paragraphs 8.25 and 26, which right expressly excludes Boeing's obligations to implement IMs. EPA's decision to proceed with the contemplated DSOA sediment cleanup as an IM, for reasons stated above, rather than as final Corrective Action (formally transmitted to Boeing on January 20, 2000) was never formally disputed by Boeing under the Order. Similarly, in Section XX, Boeing agreed that it will not initiate judicial review of the Order in language drawn from Section 113(h) of CERCLA. In view of these facts, which reflect a mutually cooperative working relationship, and with the express goal of fostering an acceptable compromise, EPA has since this dispute was initiated over a year ago made an especially concerted effort to extend to Boeing every opportunity to present arguments and alternatives to compliance with EPA's directives of May 23, 2002. Ultimately, because EPA remains committed to scientifically-based technical decisions based on objective data to the greatest extent practicable, EPA was left with no viable alternative short of the compromise set forth in the opening section of this decision.

With respect to the southern boundary of the DSOA, EPA continues to maintain that Boeing's proposed boundary in the absence of additional data from areas south of Plant 2 is arbitrary and unacceptable. Based on the information presented to date, EPA still maintains that contaminant patterns adjacent to the DSOA indicate that PCBs originating from Plant 2 releases have migrated upstream, potentially as far as the Kenworth property. However, EPA agrees with Boeing that it would be difficult to account for any "hot spots" of PCB contamination found as far upstream as the Kenworth property solely due to migration of PCB contaminated sediment originating from Plant 2 releases. Therefore, EPA has left to the Duwamish CERCLA process further investigation of contaminants upstream of the Jorgensen Forge property, and whether releases from Plant 2 have impacted sediments upstream of the Jorgensen Forge facility and downstream of Plant 2. In this decision, EPA has limited Boeing sediment sampling south of Plant 2 to a very significant degree as compared with EPA's directive of May 23, 2002, primarily as a gesture in good faith to Boeing of EPA's continuing desire for a mutually cooperative working relationship in implementing the Order. The area EPA is requiring Boeing to investigate is bounded by the Plant 2 property line to the north, the Jorgensen property line to the south, the navigation channel to the west and the line that marks the 50 feet west of the toe of the riprap slope to the east.

EPA has completed negotiations with Jorgensen representatives and has issued an Administrative Order on Consent to Earle M. Jorgensen Company (EMJ) to conduct sampling on the Jorgensen Forge

facility and within the Duwamish Waterway in order to investigate potential sources of PCB contamination from the Jorgensen Forge facility. EPA expects EMJ to submit a sampling plan for EPA review and approval by mid-September 2003.

EPA continues to maintain that the proposal for dredging of contaminated sediment along the western boundary of the DSOA as originally presented by Boeing in the ACMER would be ineffective. However, EPA believes that significant progress has been made with respect to the disputed western boundary issues. As evidenced by Boeing's April 2003 counterproposal, it appears that Boeing saw merit in EPA's western margin dredging plan as presented in the *Western Boundary Dredge Plan Technical Memorandum* of September 2002.

As demonstrated by the Administrative Record and numerous discussions between Boeing and EPA, EPA has listened to and carefully evaluated Boeing's arguments during the past year-plus and has taken those arguments into account in this decision. EPA and Boeing clearly agree that sediment cleanup within the waterway needs to proceed. EPA hopes that this decision will enable both parties to cooperatively move forward with a sediment cleanup that is both technically sound and protective of human health and the environment.

Please contact me at (206) 553-1847, or Howard Orlean or Anna Filutowski of my staff, if you have any questions regarding this decision, or next steps to be taken as we move forward toward implementation of DSOA sediment cleanup.

Sincerely,



Richard Albright, Director
Office of Waste and Chemicals Management

Enclosures

cc w/ enclosures:

Will Ernst, Boeing

Hideo Fujita, Ecology

Howard Orlean, WCM-121

Anna Filutowski, WCM-126

***Boeing Plant No. 2, Duwamish Sediment Other Area
(DSOA) Interim Measure (IM)***

**Additional Sampling and Analysis, Southern Boundary
Data Quality Objectives Memorandum, Revision 1**

1. INTRODUCTION AND PURPOSE

This revised memorandum supplements and revises the memorandum of 8/15/2002. It is presented as redline/strikeout so that specific changes may be easily viewed. The Boeing Company (Boeing) is conducting an Interim Measure pursuant to an Administrative Order on Consent [Resource Conservation and Recovery Act—RCRA—Docket No. 1092-01-22-3008(h)]. This present memorandum presents Data Quality Objectives (DQOs) for planning and executing additional field work to be accomplished during the remedial design process for the proposed Duwamish Sediment Other Area (DSOA) and Southwest Bank Interim Measures. This additional characterization was required by an EPA letter to Boeing dated 23 May 2002, directing further investigation and characterization of the sediments off the eastern shore of the Lower Duwamish Waterway south of Plant 2 at least as far up-river as the Kenworth property immediately south of the former Thompson and Isaacson properties, which last are currently owned by Boeing.

In the May letter, EPA promised a “focused framework” for Sampling and Analysis. That framework was provided by EPA in the 8/15/02 letter. Today’s DQO memorandum refines that framework.. Boeing shall develop a Sampling and Analysis Plan (SAP) for EPA review and approval in a manner responsive to all aspects of this memorandum.

The purpose of this memorandum is to update and refine the “focused framework” for use in development of the SAP, in light of additional investigations that are contemplated for the potentially-affected area. This is being done to assist progress towards a cleanup of the DSOA. The data quality objectives statements provide information required for planning further characterization of the sediments to the south of the proposed DSOA limits. The Work Plan may be a supplement to the DSOA Vertical Characterization Work Plan, should Boeing decide to use a similar analytical approach.

What is different from preceding version of this memorandum: a) Boeing has agreed to accomplish a part of the field investigation mentioned in the prior DQO memo, which will be accomplished as a part of the transformer PCB release investigation; b) EPA is in the process of negotiating an order with Jorgensen Forge to accomplish testing near outfalls 001 through 008; and c) EPA has reviewed existing data from the area between the northern Kenworth property boundary and the southern Jorgensen boundary, and concluded that this reach of river may be excluded from further testing at this. This is being done in order to accelerate the investigation of Plant 2 and to permit Boeing to

complete the remedial design; it does not mean that no further action may be required in this area. Should EPA become aware, at any time, that the contamination in the area not covered by this memorandum is caused entirely or in part by releases from Plant 2, Boeing will be responsible for investigation and cleanup of this area as well. The new understanding of the data and our mutual desire to move forward caused EPA to down-scope the investigation.

The target area for this investigation, and relation to other adjacent areas. Figure 1 shows the extents of the area to be sampled under this memorandum. This area is referred to as area I in this memorandum. Area I is bounded on the north by the DSOA/western margin of DSOA; on the west by the Federal navigation channel, on the east by a line 50 feet off the toe of the riprap slope (except for a short distance between outfalls 007 and 008, where it is reduced to about 35 feet off of the riprap toe); and on the south by the southern property line of Jorgensen Forge. The figure shows the array of "Phase I" core locations (triangular symbols) from Boeing (2003). The target area includes the prospective Phase II area, as described in the "Transformer PCB Release Investigation Work Plan, (WESTON 2003), which was not defined in this investigation. Finally, the primary collection program is restricted to PCB, metals, grain size and Total Organic Carbon.

2. DATA QUALITY OBJECTIVES PROCESS

This information is presented to set the stage for the 7-step DQO process, EPA (2000a).

The DQO process outline is:

- Step 1. State the Problem
- Step 2. Develop a Decision Rule
- Step 3. Identify Inputs to the Decision
- Step 4. Define the Boundaries of the Study
- Step 5. Develop a Decision Rule
- Step 6. Specify Tolerable Limits on Decision Errors
- Step 7. Optimize the Design

3. DQO STEP 1 - STATE THE PROBLEM

The problem is to characterize the nature (intensity) and extent (areally and by depth) of polychlorinated biphenyls (PCB) contamination in sediments in comparison to State of Washington Sediment Management Standards (SMS) in the Disputed Area. In addition, since several metals in excess of SMS have been found to be associated with the near-surface sediments near the southern end of the DSOA, metals are also included in this program. The area of focus for this memorandum is shown in Figure 1 and described in Section 1, above. The characterization will assist EPA in understanding the source of PCB. Figure 2 shows a schematic of the region of the river being examined, with the target area shown in red (which is the same as the gray area shown in Figure 1). In Figure 2, letters (A, B) indicate areas that are being sampled for remediation; roman numerals (I, II), indicate areas that are not

currently being sampled. Regarding the possible transport mechanisms (shown by arrows), the target area (area I) is potentially influenced by B, C, D, E and II. B and C are currently under consideration by EPA and Boeing, and are known areas of high PCB. D is also under investigation by Boeing, and has known high concentrations of PCB. Area E will soon be under investigation by Jorgensen Forge, targeting the outfalls and an area roughly 50-ft off the toe of the riprap on the east bank.

4. DQO STEP 2 - IDENTIFY THE DECISIONS

EPA's objective for this data acquisition is to determine the extent of contamination, and to identify patterns to facilitate contaminant source identification.

Based upon review of the existing data from the DSOA Vertical Characterization and other sources, the following are some of the patterns that EPA will weigh in addition to the data to be acquired in this new phase of investigation:

- ?? Areal Plant 2 surface or near-surface gradients of PCB, TOC and metals in relation to TOC-normalized SQS and CSL. There are clear transport or attenuation patterns from Outfall 12 and the Southwest Bank area. EPA has reviewed historic data and will combine this geostatistically with data to be collected herein to determine whether patterns appear to come from the Plant 2 facility, or other sources along the river bank or both.
- ?? Depthwise patterns of PCB adjacent to Plant 2 DSOA. In the DSOA vertical characterization data set, concentrations in the 0-1 and 2-3 foot interval that exceed CSL frequently appear to be associated with deep contamination (up to 6-7 feet below sediment surface, BSS). This offers a possible metric to associate contamination with an intense, historic, near-field source, and distinguish it from a distant one (as with a low-level river transport from another source). Concentration maxima at depth likely arise from historic releases that initially diminished with depth (as do the DSOA cores), but that have been modified in the upper sediment column by later erosion, slope failure, or some other perturbation. Such modification processes complicate the interpretation of "hot spots" from surface-only data. Concentrations at depth that are greater than those at the surface may therefore indicate that at-depth PCB patterns are more meaningful in tracing connectedness of contamination releases. A pattern of mid-depth PCB contamination (3-5 ft BSS) higher than near surface (0-3 ft) is also noted at times. In areas near sources, a pattern of mid-depth PCB contamination (3-5 ft BSS) higher than near surface (0-3 ft) is also noted at times.

4.1 PRINCIPAL STUDY QUESTIONS AND ALTERNATIVE ACTIONS

4.1.1 Question.

EPA and Ecology believe that sediment cleanup for PCB will be required in the area south of DSOA. The primary question for this investigation is:

Does the pattern of contamination implicate the Plant 2 facility, other facilities, or both, and in what relative proportion based upon collected data? This question involves both upland and inwater contamination. Other information relative to releases (not covered by this sampling effort) will be gathered for other adjoining facilities. E.g., the upland sites and near outfalls in areas D and E are being investigated. The data collection should generate results that permit comparison of the target area, (area I), with adjacent areas being investigated by Boeing and Jorgensen Forge. In this manner, it may be possible to discern the migration from upland sources that have impacted sediments in this offshore target area, and to identify who is likely contributing to the contamination.

4.1.2 Alternative Actions Based upon Results.

The alternative actions are:

Alternative 1: Establish the southern DSOA boundary to include some or all of the Disputed Area unless the data confirms that contamination in sediments south of Plant 2 were released by facilities other than Plant 2. Alternative 2: The DSOA corresponding with Plant 2 upland boundaries which Boeing has proposed will be established and (after EPA approval of the remedial design), remediation may proceed.

4.2 CONSEQUENCES OF INCORRECTLY TAKING EACH ALTERNATIVE ACTION

Responsibility for contamination in the Disputed Area will be disproportionately allocated among Plant 2 and other sources, if any.

4.3 DECISION STATEMENTS

The null hypotheses for each sample in this testing are shown in the following text box. These statements are identical to the decision statements used in the DSOA Vertical Characterization.

1. PCB Decision Statements .

- a. Organic Carbon $\geq 0.5\%$: $H_0 = \text{PCB} > \text{SMS}$ (SQS = 12 mg/kg OC; CSL = 65 mg/kg OC)
- b. Organic Carbon $< 0.5\%$: $H_0 = \text{PCB} > \text{LAET}$ (130 ug/kg) or 2LAET (1,000 ug/kg)

2. Metals (Cd, Cr, Cu, Pb, Hg, Ag, Zn) Decision Statement

$H_0 = \text{Metals} > \text{their respective SMS}$ (SQS, CSL)

(Note that metals are only being measured in surface or near-surface samples)

In addition, as indicated above, geostatistical analysis (e.g., Inverse Distance Weighting,

In addition, as indicated above, geostatistical analysis (e.g., Inverse Distance Weighing, and Natural Neighbors, or other appropriate methods) may be used to identify patterns and relationships of PCB contamination in the aggregate of samples. Other considerations could include depth of contamination, aroclor mixtures and other identifiers. Patterns will be determined by an appropriate statistical method. Chemical decision rules will be applied for individual cores or segments thereof, but the units of decision making are larger. Use of "grouping" rules such as Ecology uses, or geospatial clusters, may be used to indicate areas needing remediation. In addition, EPA will consider qualitative information generated by bore logs to indicate the depth of the disturbed, "non native" material overburden.

5.0 STEP 3 - IDENTIFY INPUTS TO THE DECISION

5.1 Terminology

The following text box is paraphrased from Crumbling, D. M. 2001. CLARIFYING DQO TERMINOLOGY USAGE TO SUPPORT MODERNIZATION OF SITE CLEANUP PRACTICE, in Current Perspectives in Site Remediation and Monitoring EPA Office of Solid Waste and Emergency Response; EPA 542-R-01-014. [This article may be found online at <http://clu-in.org/> (go to Publications and seek article link).]

Data Quality Objectives are qualitative and quantitative statements that translate non-technical project goals into technical project-specific decision goals. Project planners derive these technical DQOs from the non-technical social, economic, and/or regulatory objectives of the environmental program under which the project is being implemented. DQOs are goal-oriented statements that establish the (technical) for overall decision quality or tolerable decision error in accordance with the (non-technical) objectives driving the project. DQOs should be thought of as statements that express the *project objectives (or decisions) that the data (and its associated quality) will be expected to support*. Samples must be representative of the "true" site conditions *in the context of the decision* to be made based on those samples.

Measurement Quality Objectives (MQOs) are project-specific analytical parameters derived from project-specific DQOs. MQOs are derived by considering the level of analytical performance needed to actually achieve the project goals (as expressed in the DQOs). MQOs establish the "bar" for data performance parameters.

MQOs incorporate acceptance criteria termed *Data Quality Indicators* (DQIs). DQIs comprise limits on method sensitivity (e.g., what detection or quantitation limit is desired), selectivity (i.e., what analytes are to be targeted), analytical precision and accuracy, comparability, representativeness, and completeness.

5.2 Testing parameters

The parameters to be measured are TOC, PCB by SW 846 M. 8082, Metals by SW 846 M 610/7000, grain size by ASTM sieve series and hydrometer, and percent moisture. Bore logs shall also be generated showing Universal Soil Classification and other lithological observations.

5.3 Use of Performance Criteria from DSOA Vertical Characterization

DSOA Vertical Characterization and DSOA Geotechnical Investigation MQOs and DQIs should generally support data needs for this investigation.

6.0 STEP 4 - DEFINE THE BOUNDARIES OF THE STUDY

As stated, EPA will utilize the data to select a southern DSOA boundary (and potentially a western boundary for any portion of the DSOA south of Plant 2) for future cleanup action, and to determine the potentially responsible parties.

EPA believes that the east or shoreward boundary of the Federal Navigation channel is an appropriate boundary for the Disputed Area. Since the sediment in the navigation channel has been periodically dredged by the Corps of Engineers, it is assumed that any contamination released prior to the most recent Corps dredging would have been thereby removed. However, more recent releases, if any, which are shown to extend into the channel could require further westward characterization.

The boundary for depth has been determined by the selection of core lengths that represent either a) deep contamination patterns at the most contaminated portions of the DSOA for gradient samples, or b) shallow core lengths that represent the less-contaminated depths found in the DSOA for other types of samples. (See next paragraph for description of sample types.).

7.0 STEP 5 - DEVELOP DECISION RULES

7.1 INPUTS NEEDED FOR DECISION RULES

Vertical sample acquisition shall occur at locations shown in Figure 1, and described further below. Cores shall be segmented at 4 depth intervals (0-0.3, 1-2, 2-4, 4-6 feet BSS). At a minimum, analysis of the top two intervals shall occur for all cores. If the 1-2 foot interval is above SQS, the cores at depth 2-4 and/or 4-6 BSS must also be analyzed. The surface and 1-2 ft samples shall be submitted for grain size analysis. All core segments will be archived at 4| C in the dark awaiting a determination of whether to analyze or to reanalyze.

Table 7.1 PCB, Metals (Cd, Cr, Cu, Pb, Hg*, Ag, Zn) and Organic Carbon Samples. A=archive for possible later analysis based upon results of the 1-2 ft interval.

Type of Sample	0-0.3	1-2	2-4	4-6	Total Analyses (Without Archive)
PCB, TOC	17	17	A	A	34
Grain size	17	17			34
Metals	17	17	A	A	34
					Total Archival (Contingent) Analyses
Maximum Archived Analyses (PCB, TOC, and metals)			17	17	34

*Mercury may not be archived for long enough to permit tiered project decisions. Hence, the archive list consists of only Cd, Cr, Cu, Pb, Ag, and Zn.

8.0 STEP 6 - SPECIFY TOLERABLE LIMITS ON DECISION ERRORS

6.1 DETERMINE THE VARIABILITY OF THE ENVIRONMENTAL VARIABLE

The sampling array was developed using Visual Sample Plan (DOE, 2002), based upon a 99% confidence of discovering a 35-ft major axis elliptical hotspot at a 30' to the main river axis. (The former terminology of "gradient," "confirmation" and "spatial data gap" samples has been dropped.) This gridwise approach, which is in line with EPA (2002b) guidance for statistical sampling, is similar to that proposed by Boeing in area D. The chief difference between the latter investigations and this one is that, because active sources are expected to be more remote in area I, a larger potentially "missed" hotspot size was deemed to be appropriate, because it is expected that contamination will be more homogeneously spread and therefore easier to detect. The approach results in 17 samples being identified. The appendix is the report from Visual Sampling Plan, and Figure 1 shows the locations placed onto the Boeing-provided base map with the limits of Area I indicated.

6.2 IDENTIFY THE DECISION ERRORS

The three chief analytical decision errors are a) loss of relationship between the sample analyzed and the location intended for representation; or b), when a MQO is insufficiently sensitive to distinguish the relevant SQS or AET value; or c), when a DQI indicates that data quality has been compromised. The first is controlled by a well-conceived and documented field program and chains of custody. The second is controlled by careful planning, such as was done in the DSOA Vertical Characterization Work Plan. The third is controlled by careful planning in the QAPP and data review and validation. An additional decision error would be that trend samples suggest a substantial movement of PCB towards the Federal Channel but do not confidently bound them in that direction. In this event, the error would result in an incomplete characterization of the western boundary of prospective action. There are a number of surface samples in the Federal Channel that suggest that this is not very

likely, or that such influence would be restricted to an area proximate to channel-side samples.

The gridwise sampling approach has a 1% chance of missing a hotspot of specified size. More importantly, the gridwise approach provides a spread of samples across the area that may be used for determining patterns and trends. The potential for not being able to identify a pattern or trend when there is in fact a pattern, due to insufficient coverage by sampling, is not clearly known. The spacing shown is tighter than the spacing in the proposed DSOA boundaries, and use of that spacing was for remedial design. However, in the context of that remedial design, Boeing has opted to add samples to define "edges" for refining remedial quantities. It is EPA's best professional judgment that the proposed sampling array for area I, in conjunction with the more directed sampling nearby, will detect the "edge" of influence of DSOA (and possibly other nearby sources), and suggest the potential for commingling of PCB contamination in the sediment. The data generated may not be as refined as required for remedial design, however, as in the DSOA.

9.0 STEP 7 - OPTIMIZE THE DESIGN

Table 7-1 above indicates numbers of primary environmental samples; and an initial cost estimate is included in Appendix A. Boeing will use the approach for the DSOA Vertical Characterization and develop a Sampling and Analysis Plan for this investigation, based upon EPA (2002c).

8.0 REFERENCES CITED

Boeing (2003). *Transformer PCB Investigation Work Plan*, prepared by Weston Solutions, Inc.

Boeing (2001). *Boeing Plant 2 Duwamish Sediment Other Area (DSOA) Alternative Corrective Measures Evaluation Report*. Prepared by Pentec & MCS Environmental.

Crumbling, D. M. (2001). *Clarifying DQO Terminology Usage To Support Modernization Of Site Cleanup Practice*, in *Current Perspectives in Site Remediation and Monitoring* EPA Office of Solid Waste and Emergency Response; EPA 542-R-01-014.

EPA (2002a). *Guidance for the Data Quality Objectives Process*. EPA QA/G-4. Office of Environmental Information. Washington, DC. EPA/600/R-96/055).

EPA (2002b). *Guidance for Choosing a Sample Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan*. EPA QA-G5S. EPA/240/R-02/005.

EPA (2002c). Guidance for Quality Assurance Project Plans. EPA QA-G5. EPA
240/R/-02/009.

Figures

Figure 1. Area of Interest for this Memorandum

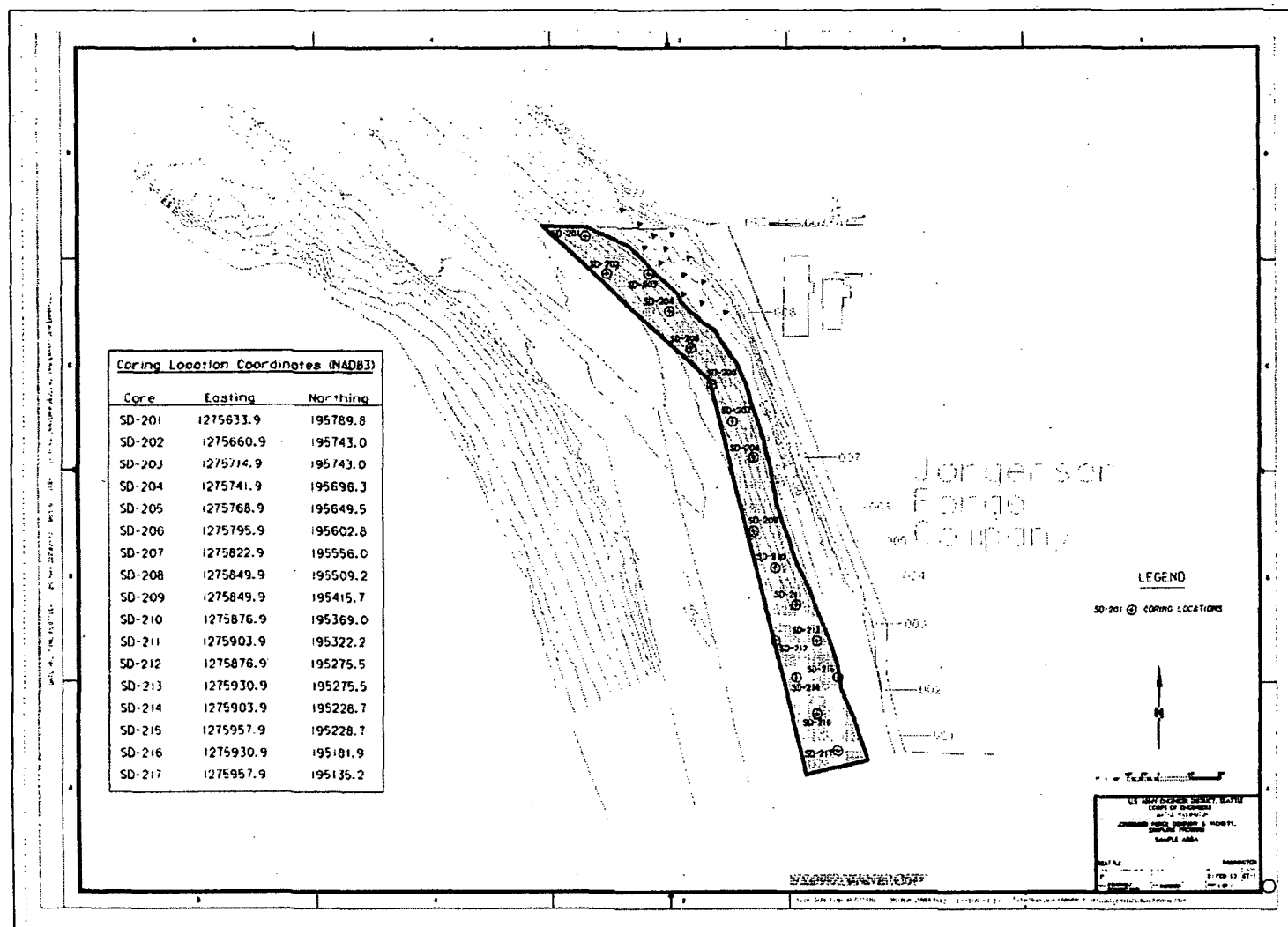


Figure 2. Schematic Diagram with Boundaries and Authorities; not to scale

